

CLAIMS

1. An exercise machine which includes an elongate frame with opposed upper and lower ends and opposed sides which form an enclosure, a resistance assembly inside the enclosure, a support member which  
5 supports the frame at an inclined position with the lower end on the ground whereby the frame on one side has an inclined upwardly facing surface and, on an opposing side, an inclined downwardly facing surface, a seat which is mounted to the frame between the upper and lower ends of the frame and which, at a first operative position, extends  
10 from the inclined upwardly facing surface, at least a first handle at the upper end of the frame which is movable by the user, on the seat, against a first resistance force which is generated by the resistance assembly, and at least a second handle at the lower end of the frame which is movable by the user, on the seat, against a second resistance  
15 force which is generated by the resistance assembly.
2. An exercise machine according to claim 1 wherein the seat is movable between the first operative position and a first storage position at which the seat overlies a first part of the enclosure.
3. An exercise machine according to claim 1 which includes a footpiece  
20 which is at the lower end of the frame and which, at a second operative position, rests on the ground to receive at least one foot of a user.

4. An exercise machine according to claim 3 wherein the footpiece is movable between the second operative position and a second storage position at which the footpiece overlies a second part of the enclosure.
5. An exercise machine according to claim 1 which includes at least one control for controlling the first and the second resistance forces.
6. An exercise machine according to claim 3 which includes at least one control for controlling the first and the second resistance forces, the at least one control being mounted to the footpiece.
7. An exercise machine according to claim 1 wherein the resistance assembly includes at least first and second components which are movable relatively to each other and wherein the first component is movable by means of one of the first and second handles relatively to the second component and to the frame, and the second component is movable by means of the other of the first and second handles, relatively to the first component and to the frame.
8. An exercise machine according to claim 1 which includes a backrest mounted to the frame above the seat.
9. An exercise machine according to claim 1 which includes at least one support which extends from the upper end of the frame and at least the first handle is supported by the support whereby the user, on the seat,

can cause the at least first handle to move downwardly relatively to the support against the first resistance force.

10. An exercise machine according to claim 7 wherein the first component is a cylinder and the second component is an elongate member which is mounted, at least partly inside the cylinder, for reciprocating movement in its longitudinal direction relatively to the cylinder.
11. An exercise machine according to claim 1 wherein the resistance assembly includes at least one resiliently deformable member.
12. An exercise machine according to claim 11 wherein the resiliently deformable member is an elastically extensible band.
13. An exercise machine according to claim 12 which includes a plurality of the bands and wherein the number of the bands in the resistance assembly can be varied.
14. An exercise machine according to claim 1 which includes a first mechanical advantage system connected to the resistance assembly whereby movement of the first handle by a first distance causes corresponding movement of at least a first part of the resistance assembly by a second distance which is smaller than the first distance.
15. An exercise machine according to claim 14 wherein the resistance assembly includes first and second ends and wherein when the at least first part of the assembly is caused to move by the first handle, the first

end engages with a first support on the frame and the second end moves relatively to the frame.

16. An exercise machine according to claim 15 which includes a second mechanical advantage system connected to the resistance assembly whereby movement of the second handle by a third distance causes corresponding movement of at least a second part of the resistance assembly by a fourth distance which is smaller than the third distance.

17. An exercise machine according to claim 16 wherein when the at least second part of the resistance assembly is caused to move by the second handle, the second end engages with a second support on the frame and the first end moves relatively to the frame.

18. An exercise machine which includes a frame, a resistance assembly supported by the frame, a first actuator which is movable by a user from a first rest position against a first resistance force which is dependent at least on the resistance assembly, to cause movement of at least a first part of the resistance assembly, the first actuator including at least a first device which is movable by the user and a first mechanical advantage system connected to the resistance assembly whereby movement of the first device by a first distance causes corresponding movement of the at least first part of the resistance assembly by a second distance which is smaller than the first distance, a second actuator which is movable by the user from a second rest position against a second resistance force which is dependent at least

on the resistance assembly, to cause movement of at least a second part of the resistance assembly, the second actuator including at least a second device which is movable by the user and a second mechanical advantage system connected to the resistance assembly whereby movement of the second device by a third distance causes corresponding movement of the at least second part of the resistance assembly by a fourth distance which is smaller than the third distance.

19. An exercise machine according to claim 18 wherein the resistance assembly includes first and second ends and wherein when the at least first part of the assembly is caused to move by the first actuator, the first end engages with a first support on the frame, and the second end moves relatively to the frame, and wherein when the assembly is caused to move by the second actuator, the second end engages with a second support on the frame and the first end moves relatively to the frame.

20. An exercise machine according to claim 18 wherein the resistance assembly is a piston and cylinder assembly, and which includes apparatus for establishing a controlled fluid pressure inside the cylinder whereby the resistance force is dependent at least on the fluid pressure inside the cylinder.

21. An exercise machine according to claim 20 wherein movement of the first actuator causes telescoping movement of the piston and cylinder assembly.

22. An exercise machine according to claim 21 wherein the fluid pressure is increased by the telescoping movement of the assembly, and exerts a force which tends to extend the assembly and restore the first actuator to the first rest position and the second actuator to the second rest position.
23. An exercise machine according to claim 22 wherein the piston includes a piston head which is mounted for reciprocating movement inside the cylinder and a piston rod which is attached to the piston head and which extends from the cylinder, the fluid pressure inside the cylinder on opposed sides of the piston head being the same, and wherein the increase in fluid pressure, due to the telescoping movement, is dependent on the extent to which the piston rod extends into the cylinder.
24. An exercise machine according to claim 23 wherein the piston rod includes a hollow interior and has a sealed end which is remote from the cylinder and an open mouth which is located inside the cylinder whereby the fluid pressure in the hollow interior is the same as inside the cylinder.
25. An exercise machine according to claim 20 wherein the apparatus includes a fluid pump for pressurising fluid inside the cylinder and a pressure relief device for reducing in a controlled manner the pressure of the fluid inside the cylinder.

26. An exercise machine according to claim 20 wherein the apparatus includes a gas-pressurised cylinder.
27. An exercise machine according to claim 20 wherein the apparatus is positioned inside a housing which is mounted to the frame.
- 5 28. An exercise machine according to claim 20 wherein the apparatus is positioned remotely from the frame.
29. An exercise machine according to claim 20 which includes controls for controlling the fluid pressure inside the cylinder.
- 10 30. An exercise machine according to claim 29 wherein the controls are foot-operated.
31. An exercise machine according to claim 27 wherein the housing forms a footpiece at a lower end of the frame and which includes a first control mounted to the footpiece for controlling the fluid pump and a second control mounted to the footpiece for controlling the pressure relief device.
- 15 32. An exercise machine according to claim 18 wherein the resistance assembly includes at least one resiliently deformable member.
33. An exercise machine according to claim 32 wherein the resiliently deformable member is an elastically extensible band.

34. An exercise machine according to claim 33 which includes a plurality of the bands and wherein the number of the bands in the resistance assembly can be varied.

5 35. An exercise machine according to claim 18 wherein the frame is elongate with a lower end and an upper end and which includes at least one support member to support the frame at an inclined position relatively to the ground.

10 36. An exercise machine according to claim 35 which includes a seat which is mounted to the frame between the lower end and the upper end thereof.

37. An exercise machine according to claim 36 which includes a footpiece at the lower end of the frame.

38. An exercise machine according to claim 37 which includes at least one control for controlling the resistance force.

15 39. An exercise machine according to claim 38 wherein the at least one control is mounted to the footpiece.

20 40. An exercise machine according to claim 18 wherein the frame is elongate with opposed upper and lower ends and opposed side walls which form an enclosure and the resistance assembly is supported inside the enclosure.



41. An exercise machine according to claim 40 which includes a seat which is mounted to the frame between the upper and lower ends thereof, the seat being movable between an operative position and a storage position at which the seat overlies a first part of the enclosure and of the resistance assembly and a footpiece at the lower end of the frame which is movable between an operative position and a storage position at which the footpiece overlies a second part of the enclosure and of the resistance assembly.
42. An exercise machine according to claim 18 wherein the first device includes first and second handles which are positioned at an upper end of the frame near respective opposing sides of the frame and which are connected to the first mechanical advantage system.
43. An exercise machine according to claim 42 wherein the second device includes third and fourth handles which are positioned at a lower end of the frame which opposes the upper end, and near opposing sides of the frame, and which are connected to the second mechanical advantage system.
44. An exercise machine according to claim 35 wherein the inclined frame has an upwardly facing front side and a downwardly facing rear side and wherein the first actuator further includes a support which extends from the upper end of the frame at least partly over the front side and the first device includes at least one handle which is supported by, or

which forms part of, the support and which is connected to the first mechanical advantage system.

45. An exercise machine according to claim 36 which includes a structure which is pivotally mounted to the seat, at least one formation on the structure against which at least one foot of a user, on the seat, reacts, and at least one link between the structure and the second actuator whereby movement of the structure relatively to the seat results in movement of the resistance assembly.

46. An exercise machine which includes an elongate frame which forms an enclosure, a resistance assembly located at least partly in the enclosure, a support member for supporting the frame at an inclined position with an upwardly facing front side and a downwardly facing rear side, a seat extending from the front side of the frame at a location at which part of the frame opposes a back of a user seated on the seat, and at least a first actuator which is movable by the user against a first resistance force which is generated by the resistance assembly.

47. An exercise machine according to claim 46 wherein the resistance assembly includes a piston and cylinder assembly which is positioned between opposed members on the frame, and which includes apparatus for pressurising an interior of the cylinder, a first mechanical advantage system operable by the user by means of the first actuator to telescope the assembly against the first resistance force by moving the piston relatively to the frame with the cylinder stationary, a second

actuator, and a second mechanical advantage system operable by the user by means of the second actuator to telescope the assembly against a second resistance force which is generated by moving the cylinder relatively to the frame with the piston stationary.

5        48.    An exercise machine according to claim 47 wherein the piston includes  
an elongate member with a first end and a second end, the elongate  
member extending partly into the cylinder with the first end inside the  
cylinder and the second end outside the cylinder, the elongate member  
being mounted for reciprocating movement, in its longitudinal direction,  
10        relatively to the cylinder, and a piston head, with inner and outer sides,  
which is fixed to the first end of the elongate member and which acts to  
guide the reciprocating movement of the elongate member and  
wherein, inside the cylinder, the pressure on the inner side of the piston  
head is the same as the pressure on the outer side of the piston head.

15        49.    An exercise machine according to claim 46 wherein the resistance  
assembly includes an elongate first cylinder with a first cross sectional  
area, an interior of the first cylinder, in use, being pressurised with a  
gas, and an elongate member with a first end and a second end, the  
elongate member extending partly into the interior of the first cylinder  
20        with the first end inside the first cylinder and the second end outside  
the first cylinder, the elongate member being mounted for reciprocating  
movement, in its longitudinal direction, relatively to the first cylinder,  
and wherein the elongate member, upon being moved by a distance  $\ell$

into the interior of the first cylinder, displaces a volume of gas which is given by the expression  $\ell \times a$  where  $a$  is a second cross sectional area which is smaller than the first cross sectional area.

50. An exercise machine according to claim 49 wherein the elongate member is tubular with a hollow interior and the first end is open and in communication with the interior of the first cylinder, and the second end is sealed.
51. An exercise machine according to claim 50 wherein the cross sectional area of the hollow interior is equal to the second cross sectional area.
52. An exercise machine according to claim 49 wherein the elongate member has a cross sectional area which is equal to the second cross sectional area.
53. An exercise machine according to claim 52 wherein the elongate member is solid.
54. An exercise machine according to claim 49 which includes a piston head, with inner and outer sides, which is fixed to the first end of the elongate member and which is engageable with an internal surface of the first cylinder and which acts to guide the reciprocating movement of the elongate element and wherein, within the interior of the first cylinder, the pressure of the gas on the inner side of the piston head is

the same as the pressure of the gas on the outer side of the piston head.

55. An exercise machine according to claim 54 wherein the piston head includes at least one formation which allows for free movement of gas, inside the interior of the first cylinder, between the inner side of the piston head and the outer side of the piston head.
56. An exercise machine according to claim 55 wherein the at least one formation is a passage in the piston head between the inner side and the outer side thereof.
57. An exercise machine according to claim 49 which includes a second cylinder which is located at least partly within the first cylinder and which includes an inner end through which at least part of an interior of the second cylinder is placed in gas communication with the interior of the first cylinder and an outer end, the elongate member extending partly into the second cylinder with the first end of the elongate member inside the second cylinder and the second end of the elongate member extending from the outer end of the second cylinder, the reciprocating movement of the elongate member taking place inside the second cylinder, and a piston head at the first end of the elongate member which is in sealing and reciprocating contact with an opposed inner surface of the second cylinder.